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THE OXIDE PURIFIER

GRB 43 is the interim report of the Purification Panel which was promised in the discussion of Mr. G. U. Hopton's paper on oxide purification which we reviewed in these columns last April. It deals with the caking of oxides of types ordinarily in use and with the development of pressure in boxes using them. It is the result of investigations into 14 examples of current practice. Considering the difficulty in "controlling" the constituents of such complex and heterogeneous materials as those in question the investigators are to be congratulated on having crystallized out quite a number of definite rules by the observance of which hardening and back pressure may be obviated with a fair degree of certainty.

Figures are put to some terms already in currency. Some of the recommendations are very little more than what has been recognized as good practice for a very long time. That the charge should be of low density (was it fixed before at not more than 25 lb./cu. ft.?), by the use of lightening agents added to a "suitable oxide," by adjustment of moisture content as charged, and by careful filling, would seem to be obvious. That tar in the boxes should be avoided by every possible means seems no less obvious, but there have been disappointments in the use of the electric detarrer for which reasons are given in this report. Minimum moisture content is defined as 10% in the spent oxide, while the desirability of securing even distribution of sulphur throughout the mass by a regular reversal of flow and in some cases by admitting air to the box in the second position, and of maintaining a quick reaction in the boxes is confirmed.

Causes of caking and back-pressure seem to have been generally inferred from measures empirically adopted (they are none the worse for that) to cure them. In view of the considerations above referred to it is not surprising that they are no further related to the constituent composition of the material than that varying degrees of blending fresh with part-spent material have been practised. The most immediately interesting of the discussions of the principal indications of the survey is that of the possible necessity of some revision of standard designs and arrangements of the gas cooling and condensing plant and particularly the point of application, and possibly double application, of the electric detarrer. It is suggested that tar should be precipitated in two stages, one presumably as now immediately after the exhauster and one after the gas has been cooled right down below the temperature of the last purifier box. Tar fog would be completely removed at this low temperature, after which the gas would be reheated before entering the purifiers. This seems to be one of the most convincing of the recommendations made in the report.

Even if all the Panel's recommendations are acted upon, however, complete immunity, when using the usual mixtures, cannot be guaranteed. Caking cannot be definitely ascribed to any "over-riding factor." Among questions awaiting further investigation are the influence of blending and disintegration on bulk density and size analysis in parallel with the control afforded by adjustment of moisture content, the effect of longer rotation periods, and generally it is proposed to make large-scale tests on selected variables; the last a sound policy which, however, it is recognized may take a very long time.

It will bear repetition that hydrogen sulphide removal by means of dry oxide is a process which has served the gas industry well for a long time and is likely to continue to do so for a long time to come. The new materials described by Mr. Hopton can improve it on what may be called the chemical side, and they will not unduly increase its, so far, low cost. This low cost has made it very difficult for any competition on the part of other methods to get a chance of success. But it will not be overlooked that labour costs tend to grow with labour difficulties and this advantage of low cost tends to disappear. Designers are fully aware of this. The first answer is mechanization, one form of which is the tower purifier. Others must be sought. But we shall make no secret of the fascination with which we heard Mr. Hopton's suggestion to substitute, for the crudely compounded "oxides" hitherto used, new materials, definitely sized, prepared in pre-determined fashion from accurately known substances. We hope that the use of the new materials will be included in the investigations still to be undertaken and that the Final Report will tell us whether we may now look forward to a definite advance in the art of dry purification.

At any rate the members of the Purification Panel and their scientific workers may rest assured that they are dealing, and successfully so far, with one of the most important problems with which the industry is faced.

The President of
The Institution of Gas Engineers
Mr. E. Crowther and Mrs. Crowther
send to all members of the Institution and to other friends in and connected with the Gas Industry their Cordial Greetings and Best Wishes for Christmas and the New Year

DISPOSAL OF RESIDUALS

IT may be said, broadly speaking, that papers presented to the gas industry are of three types. First, there is the historical or narrative type which relates in chronological order the development of a works, a plant, a load, or a

product; the facts are presented and the listener is allowed to draw his own conclusion. Secondly, there is the paper which is published at the completion of an investigation, in which the research worker makes his periodical emergence from obscurity to publicize the results of his labours. Thirdly, there is the paper which could equally be termed a survey; in it relevant facts are gathered from numerous sources and sifted and marshalled to illustrate the author's argument.

Although Mr. C. L. Evans is a Research Chemist with the Birmingham Gas Department, his Presidential Address to the Midland Juniors belonged to the third category, the survey. It was a survey of unusual merit in that its composite parts, if separated, became short papers in their own right. When the sections were grouped to Mr. Evans's own design they formed a servicable and an astute picture of the facilities available for the disposal of the industry's by-products. The title of the Address—"Future Disposal of Residuals"—was justified by the careful breaking down of the subject and the author's courageous deductions. At the outset Mr. Evans stressed the fact that his remarks were intended primarily for the technical assistant and junior engineer, but we have little doubt that engineers and chemists somewhat older in the tooth will find this carefully prepared mosaic of current research literature a valuable guide and a provocative stimulant.

Mr. Evans pointed out that, although it is affirmed that the revenue from residuals is no longer an important factor in the price structure, this loss of revenue is largely due to the chemical industry's reluctance to accept the much vitiated products arising from the carbonization of coal. In the future, stated the author, the danger lies in the fact that many of these residuals are likely to prove an embarrassment, causing a serious debit on the balance sheet. Failure to market surplus coke, high charges for liquor disposal, and costly-to-produce unsaleable spent oxide would seriously reflect on the cost of gas production.

Mr. Evans is sceptical about the value of a two-fuel industry. He champions complete gasification, in spite of its low thermal efficiency and its dependence on imported oil. He pins faith to the enriching value of the waste gases from other industries—*e.g.*, the digestion gas from the larger sewage works. We think that he is mistaken in this belief. Maybe by-product gases from other industries have not received recognition from the gas industry. The fact is that these waste gases do not exist in any quantity to be of practical use.

In regard to the disposal of ammoniacal liquor, Mr. Evans foresees a difficult time ahead unless steps are taken to regionalize sewage purification. With large gas production units, the tendency will be to disturb the existing ratio between the liquor make and the dry-weather sewage flow. The author explored various methods whereby the disposal could be carried out effectively with the maximum economy to all parties. He remarked that the biological oxygen required to render innocuous the aqueous products from one ton of coal at one works may be different from that obtaining at another works, and suggested that instead of the existing charge based on tonnage of coal carbonized, a more effective system could be founded on the oxygen loadage of the bacteria beds caused by the effluent discharged. We suggest that the gas industry, thanks to the efforts of the Liquor Effluents and Ammonia Committee of the Institution of Gas Engineers, has full information to meet its liquor disposal problems. The trouble is that the recommendations of this Committee are not sufficiently put into effect.

THE GAS ACT EXPLAINED

We have studied the gas industry nationalization measure for just under a year, but we still welcome with as much eagerness as that with which we perused the "explanatory and financial memorandum" which formed a preface to the first print of the Gas Bill last January any enlightenment that is offered in simple language. For the convenience of the industry at large, as well as for anyone outside it who is genuinely interested, the British Gas Council a few weeks ago issued Mr. J. R. W. Alexander's extremely able summary of the structure of the industry under the Gas Act. To our store of explanatory notes and interpretations may now be added *A Guide to the Gas Act*, 1948, which has been prepared by Mr. Edward T. Warren, J.P., F.C.I.S., Secretary and Chief Accountant of the Watford and St. Albans Gas Company, for some of his friends in the industry. Having perused the 35 pages of the *Guide*, with its very well arranged index, we can say that we are glad indeed that Mr. Warren has counted us among his friends in the sense of having sent us a copy. Certain ministerial statements, made in the Standing Committee of the House of Commons, which amplify some of the clauses in the Act, have been included; in addition there is a summary showing the disposition of powers and duties among the various controlling bodies who have to implement the provisions of the Act. According to Mr. Warren's interpretation, Parliament has four duties, the Ministry of Fuel and Power has 22, the Gas Council has 18, the Area Boards have 17, and the Gas Consultative Councils four. The Consultative Councils are to be established not later than six months after the vesting date, and each Area Board is to have as one of its members the Chairman of the Consultative Council for the area concerned, but "pending the establishment of the Consultative Council the Board is deemed to be properly constituted without such member." Finally, the *Guide* includes a summary of the code of provisions relating to gas supply, and provisional lists of the constituent undertakings in the areas of the Eastern and South Eastern Gas Boards.

IMAGINATIVE TECHNIQUE

It has been our privilege to see on the screen during the past few years the educational films produced by the British Gas Council. From a somewhat shaky start the B.G.C. has developed a gripping story about the underlying purpose of a prosaic but highly important industry. Last Friday, at the Curzon Cinema, London, the Council invited a representative cross-section of the social life of to-day to view two or three of the new efforts. The response to the invitation was sufficient to fill that admirable west-end picture house. An audience capable of criticism was favourably impressed. The audience included several small bright-eyed children who will have registered that M. and B comes from coal. They will perhaps have registered too the value of ventilation and will in their later years appreciate that the Government-sponsored experiments at Abbots Langley are scientifically fug-minded. We believe that the British Gas Council's film efforts are sufficiently in advance of the times to merit current approbation.

A "DUNKIRK" SPURT

One of those inexplicable spurts in output which confound both critics and sympathizers of the organization of the coal industry was made by the miners in the week ended Dec. 11. They produced a total of 4,405,500 tons, an increase of 65,500 tons on the previous week and of 38,100 tons over the corresponding period last year. This total was last exceeded in the original "Dunkirk" spurt of the week to July 27, 1940, when output reached 4,483,000 tons. Deep-mined production for the week to Dec. 11 was 4,213,300 tons which showed a rise of 67,300 tons on the preceding week and of 29,000 tons over the same week a year ago. This deep-mined figure was last exceeded in December, 1942. Though a new peak is expected to be reached in the current week it seems unlikely that the miners will reach their target of 200 mill. tons, as this would mean raising almost 14 mill. tons in three weeks, including two holiday weeks. Deep-mined output for the 49 weeks of the year to date is now 186,118,900, or 9.4 mill. tons more than last year, an increase of 5.3%. A shortfall, to use the word brought into the limelight by the Ministry of Food, of two or three mill. tons will be partly filled by opencast coal, where the year's target of 11 mill. tons has been passed by 283,000 tons with three weeks still to go. The improvement is something to be thankful for though it is not enough to give shelter to Mr. Gaitskell, who has been under fire in the Committee stage of the Coal Industry Bill to divest members of the National Coal Board of some of their functional duties. He has been arguing that it would be difficult to put into a Bill exactly what the Opposition wants, but he has said that he feels sure that the Board will continue to make changes in its organization.

CHEMICAL ENQUIRY

Mr. Harold Wilson, the President of the Board of Trade, has been consulting with the Minister of Fuel and Power, the Minister

of Health, and the Minister of Supply, all of whom are responsible for some part of the chemical industry, as to how an enquiry could be made which would give the Government "a comprehensive survey" of this basic industry. Replying to Mr. J. Hoy (Lab., Leith) in the House of Commons, he said that he felt the Government should have such a survey, showing the industry's long-term plans, its probable lines of development, and the steps regarded as necessary to meet the objectives disclosed in the survey. With the chemical industry playing an ever more important part in the export programme, a Governmental desire to know more about its plans is natural enough and the co-operation of the industry itself has been secured. As a first step, the Association of British Chemical Manufacturers has been asked to prepare a report which it will try to have ready by mid-1949. The Trades Union Congress has also been consulted and has expressed agreement with this line of approach. The working party technique introduced by Sir Stafford Cripps, is not being adopted in this case because the chemical industry is complicated and diversified. No decisions on policy on the basis of the report, if any were called for, would be made without further consultation with both sides of industry, Mr. Wilson said.

Personal

Ordered a prolonged rest by his medical advisers, Mr. A. G. WILLIAMS, General Manager and Secretary of the Wolverhampton Gas Company, is retiring at the end of the year after more than 50 years' service in the gas industry. Mr. Williams began his career with the Leicester Gas Department. In 1923 he was appointed Secretary of the Wolverhampton Gas Company, becoming Commercial Manager and Secretary in 1929 and General Manager and Secretary in 1945. For many years he has been connected with the work of various organizations of the industry, including the British Gas Council, the Federation of Gas Employers, the N.J.I.C., and the Midland Counties Coke Association, and for the last few years has been Chairman of the Midland District Federation of Gas Employers, and Vice-Chairman of the Midland Joint Industrial Council. The Directors have appointed Mr. W. MACNAUGHTON, M.Inst.Gas E., as General Manager and Chief Engineer, as from Jan. 1. Mr. Macnaughton has been with the Company for 28 years, for the past three years of which he has been Chief Engineer. He joined the Company in 1920, having been previously with the Coventry Gas Department. He was appointed Assistant Engineer in 1929, and Chief Engineer in 1945. He is a Past-President of the Midland Junior Gas Association and a member of various associations connected with the gas industry, including the Midland Regional Gas Engineering Advisory Board. Mr. F. ELLEDGE, A.C.I.S., has been appointed Secretary and Accountant, and Mr. E. L. WALLIS, A.M.Inst.Gas E., Deputy Engineer and Manager, as from the same date.

News in Brief

In Woman's Hour on Dec. 8 a discussion took place on fuel economy for the housewife between the Women's Gas Council, the Women's Advisory Council on Solid Fuel, and the Electrical Association for Women. Miss Maywen Godby, of the Women's Gas Council, gave hints on the use of gas to save the housewife's time as well as the nation's fuel.

Changes in the Programme of the London and Southern Junior Gas Association are announced as follows: Mr. W. F. Moore's paper, "Some Problems of Heating and Hot Water Supply in the Gas Industry," originally arranged for Feb. 9, will be presented on Jan. 14 (at 7 p.m.), and Mr. T. V. Garrud's paper, "An Industrial and Commercial Gas Sales Organization," which was to have been given on Jan. 14, will be presented on Feb. 9 (at 2.30 p.m.).

Details of the Salaries and Allowances of members of central and area nationalized boards were given by the Prime Minister in a Parliamentary answer in the House of Commons on Dec. 15. Names were also given of those serving on more than one board, including that of Sir John Stephenson, Chairman of the Eastern Area Gas Board and Deputy-Chairman of British South American Airways Corporation, whose salary for the combined appointment was stated to be under consideration. The standard salaries for the two positions are £4,500 and £1,500 respectively, plus expenses allowances.

Accepting an Invitation to address the annual conference of the British Gas Staff Association next May, Mr. A. E. Sylvester, Chairman-Designate of the Gas Council, in a letter to the General Secretary, writes: "Now that nationalization of the industry has become no longer a matter of debate, it is the clear duty of everyone concerned with it to do his utmost to make it a success. The only solid foundation for this is mutual confidence between those who are appointed by the Government to adminster and those who are employed in the service of the Council and Boards. I shall do my utmost to further this."

CORK GAS ORDER

Moving the Cork Gas Order, 1948, Mr. L. Cosgrave, Parliamentary Secretary to the Eire Minister for Industry and Commerce, said that the Cork Gas Consumers' Company had applied for an Order to effect certain alterations and modifications in the Cork Gas Order, 1868. The principal object of the Order was to provide for an increase in the borrowing powers to the extent of £150,000, to authorize the creation and issue of debenture stock, interest being limited to 4%. The immediate purpose for which the money was required was to provide additional plant, at a cost of £47,000; provision of a high-pressure main, at a cost of £80,000, and provision of improved steam production and mechanical equipment, costing £6,000.

The Dail approved the Order.

NEWS IN ADVERTISEMENTS

The usefulness to research workers of advertising pages of technical journals was stressed in a paper read on Dec. 3 to the Association of Special Libraries and Information Bureaux at the Institute of Technical Engineers by Mr. Geoffrey A. Shires, M.Sc., of Fort Dunlop's research centre.

Anything up to 80% of a technical journal to-day consisted of advertisements, he said, and those advertising pages should not be regarded as a bore; they were a legitimate quarrying ground for an information service. Details of plant or apparatus might be as important as a piece of scientific investigation; with some products, where fashion or stock changed fairly often, advertisements became one of the few instances where technical information really justified "hot" service.

Again, the notice of a paper to be read might be the first intimation of new or important work.

Finally, said Mr. Shires, a surprising amount of information could be gleaned from appointments vacant or wanted, such as new centres of research, new subjects of instruction, fresh commercial developments, salary scales, and changes of personnel.

Limitation of Advertising

Mr. H. Wilson, President of the Board of Trade, in a Parliamentary written reply to Lieut.-Colonel G. M. Sharp (Spen Valley, Lab.), on Dec. 16 stated that the voluntary limitation of advertising is to be continued after the expiry of the present scheme in February, with some modifications in its details. Mr. Wilson stated that he and the Chancellor of the Exchequer had discussed the future of the scheme with the representatives of the Federation of British Industries Advertising Committee. He understood that the Federation of British Industries would circulate details of the modifications to participants in the scheme, and would make them available to the Press. The revised plan, which comes into operation on Mar. 1, places the responsibility of limiting advertising on the advertiser and deletes the financial conditions which now exist, it being expected of the leaders of industry that they will only spend on advertising amounts that are economic from the point of view of their own position and that of the nation. It is recognized that there is still a danger of inflation, and that goods with the highest rate of purchase tax are still in short supply.

Diary

Jan. 4.—**National Federation of Gas Coke Associations**: National Technical Committee, Gas Industry House, 2.30 p.m.

Jan. 6.—**Women's Gas Council**: Headquarters Members, Gas Industry House, 3 p.m.

Jan. 8.—**Scottish Junior Gas Association (Eastern District)**: "Industrial Gas Appliances and Utilization," A. H. Holden, B.Sc. (British Gas Furnaces, Ltd., Chesterfield), Edinburgh.

Jan. 10.—**London and Counties Coke Association**: Technical Committee, Gas Industry House, 2.30 p.m.

Jan. 10.—**Women's Gas Council**: Executive Committee, Gas Industry House, 1 p.m.

Jan. 11.—**Federation of Gas Employers**: Central Committee, Gas Industry House, 11.30 a.m.

Jan. 11.—**British Gas Council**: Central Board, Gas Industry House, 2.30 p.m.

Jan. 12.—**B.G.C. Domestic Development Committee**: Technical Sub-Committee, 10.30 a.m.; Main Committee, 2.30 p.m., Gas Industry House.

Jan. 12.—**Eastern Junior Gas Association**: "Gas-Works Paints and their Application," E. M. Pool (Technical Representative, Donald McPherson & Co., Ltd.), Stamford.

Jan. 14.—**London and Southern Junior Gas Association**: "Some Problems of Heating and Hot-Water Supply in the Gas Industry," W. F. Moore, Assoc.I.H.V.E. (Wandsworth and District Gas Company), Gas Industry House, 7 p.m.

PRESSURES DEVELOPED BY BRITISH COALS DURING CARBONIZATION

There has been published by the British Coke Research Association Technical Paper No. 2—A Study of the Pressures Developed by British Coals During Carbonization—prepared for the Association by the Pontypridd Test Plant Committee. On Wednesday last, Dec. 15, a conference of the Association was held in London to consider the Committee's report, a summary of which we give here.

THE Pontypridd Test Plant Committee consisted of Dr. W. Idris Jones (Chairman), D. T. Barritt, H. E. Blayden, T. C. Finlayson, N. L. Franklin, J. P. Graham, G. E. Hall, Dr. J. Hamilton, Dr. W. E. Harris, D. Hicks, G. W. Lee, and F. S. Townend.

Mr. N. L. Franklin was in charge of the research, assisted by Messrs. R. O. Richards, J. Ritson, G. Bradford, and D. Phillips.

Several organizations have contributed to the research. The Coal Survey Organization, in the first place under the ægis of the Department of Scientific and Industrial Research, and later through the National Coal Board, co-operated in the work of selecting coals, in obtaining trustworthy samples, and in providing analytical data. A site and other facilities for carrying out the work were readily placed at the disposal of the Committee, in the first instance by the Powell Duffryn Companies and later by the National Coal Board. Invaluable help was given by these two bodies, the former in providing facilities for initiating the work and the National Coal Board by continued participation in the activities of the Committee. Assistance was provided throughout the programme by the Woodall-Duckham Company, who were responsible for designing and building the test plant, and this Company and Simon-Carves, Ltd., assisted in the operation of the plant. The following laboratories have co-operated in the work : Coal Survey, Guest Keen Baldwin, Northern Coke Research Committee, Powell Duffryn, Woodall-Duckham.

The Koppers Company, Inc., of Pittsburgh, Pa., made available through the medium of the Woodall-Duckham Company the basic data in connexion with the design and operation of the test oven.

With the development of the modern fast-coking oven of large capacity the possibility of damage to the oven walls caused by excessive pressure in the charge has become widely recognized. From time to time instances have occurred where serious damage traceable to this cause has entailed premature rebuilding of the ovens or has involved undue maintenance costs in order to keep the ovens at work.

Experience shows that coals which are likely to cause difficulties of this nature are generally to be found among those having volatile content on the dry ash-free basis below about 25%. The serious economic consequences of damage of the character indicated above have led to many attempts at devising tests which can discriminate between "safe" and "dangerous" coals before they are charged to the oven. These attempts have, in general, followed two principal directions.

On the one hand, laboratory methods have been devised in which small samples of coal are heated either under conditions of substantially constant volume, in which case the pressure developed in the coal charge is taken as an indication of the character of the coal, or under conditions of constant pressure, in which case the volume change is employed as the index to the character of the coal. Baum and Heuser have reported comparisons of the two methods of assessment.

On the other hand, attempts have been made to approximate more closely to practical carbonizing conditions by increasing the scale of the tests. Koppers, for example, increased the scale of his original test and employed in it 10 kg. of coal. Further work in this direction, utilizing both constant volume and constant pressure conditions of coking, has been reported by a number of authors. In practically all these attempts, apparatus employing heating from one side of the charge was employed. An important development was the design by Koppers and Jenkner of a small test oven in which heating of the coal charge was effected from both sides. One of the oven walls was movable and the pressure exerted on it by the charge was measured. The use of two sided heating was a distinct and important development, because it is only when coalescence of the two plastic layers occurs under such conditions of heating, that full development of pressure in the charge is possible. The value of this method as developed by Koppers has been recognized by American investigators, who have adopted the Koppers test oven with some modifications. The practical utilization of these various tests, including even the Koppers test oven, is complicated by the difficulty of correlating the test results with the behaviour of coals in the full-scale oven. Koppers has attempted to circumvent this difficulty by comparing results obtained in his test oven with the lateral pressure which could be resisted by a cold coke oven wall without causing breakdown or serious damage to the wall. He proposed that coals that created pressures of more than 1 lb./sq. in. in the test oven should be regarded as liable to cause damage to oven walls. Other workers appear tentatively to have adopted somewhat higher figures.

Indirect methods of assessing the "damaging" potentialities of coals by utilizing data obtained from measurements of the resistance to gas flow shown by the softened coal, from direct measurements of the "fluidity" of the coal during carbonization, or from measurements of the rates of volatile matter evolution have not proved fruitful, because of difficulties of correlation with practical data. Work of this nature has, however, proved of value by indicating the causes of the development of pressure in oven charges.

The work of Russell and his collaborators of the Koppers Company of America has, within the last few years, provided valuable data on the liability of coals to cause damage to oven walls because of the development of excessive pressures during coking. Their data are, however, confined to American coals, and analogous data relating to British coals are almost entirely lacking. The Koppers type of test oven offers the most reliable means of studying the technically important factors involved in the development of pressures in coke ovens. It is evident, however, that the data yielded by this oven are of value only in relation to experience of the behaviour of the coals concerned in full-scale practice. There is therefore a clear need for study of the behaviour of British coals in reference to their tendency, or otherwise, to develop excessive pressure during coking. The importance of this study is emphasized by the present desirability of extending, as far as possible, the available range of coking coals.

The investigations described in the report were therefore undertaken to provide some, at least, of the urgently needed data which, so far as British coals are concerned, were not available before the commencement of this work.

The programme of work projected comprised a survey of the behaviour in the test oven of some 70 British coals having a volatile matter content in the range of 13% to 36%. Because of the technical importance of the low volatile South Wales coking coals, a relatively large number of coals from this coalfield were examined. It was also decided to examine the coals tested in the oven by the better known laboratory tests which have, from time to time, been claimed to assess the "dangerous" swelling tendencies of coals.

During the course of the work, it was recognized that some information on the influence of blending, bulk density, rate of heating, and oven width was desirable for the satisfactory assessment of the test data. The programme was therefore extended to include, as far as possible, a study of these factors, and it was supplemented by an examination of the behaviour of certain industrial blends. More extensive data in these directions are required.

Practical Significance of Test Results

The Pontypridd test oven, like earlier movable-wall test ovens, such as that of Heinrich Koppers, may be considered to provide a closer approach to industrial conditions than the small-scale tests which have hitherto been used in this type of investigation. The size grading of the charges, the rates of heating employed, the temperature of operation, and the provision of heating flues at both sides of the oven, are all points at which the manner of testing in the Pontypridd test oven approximates to commercial coke oven operation.

The tests that have been carried out in the movable-wall oven, under standard conditions,* have shown that coals having a volatile matter content (on the dry ash-free less CO_2 basis) above a certain figure show little or no pressure during carbonization. This figure is generally of the order of 25%, but is about 30% for some of the upper seams of South Wales. The majority of coals in Great Britain comply with this condition and will not present any difficulty due to pressure development during carbonization. The tests have shown that as the volatile matter content of the coal declines below the figure just mentioned, the maximum pressure produced rises, and may reach a high value. Such British coals generally occur in South Wales, but similar behaviour in the test oven has been demonstrated with certain coals from Durham, Kent, and Somerset.

It has been shown that:

(*a*) The maximum pressure developed during carbonization in the movable-wall oven is progressively reduced by reduction of the bulk density at which the coal is charged. The maximum pressure was found to be below 1 to 2 lb./sq. in. at bulk densities between 40 and 45 lb./cu.ft.

(*b*) Reduction in the rate of carbonization causes little change in the maximum pressures developed by a coal when coked in the test oven at rates greater than 1.25 in. per hour. (There were practical difficulties in reducing the rate of carbonization below this figure.)

(*c*) Increase in the width of the oven (other factors remaining the same) had little influence on the pressure exerted by a coal during carbonization.

(*d*) British coals can be classified according to their liability to develop pressure during carbonization. Such classification provides additional support to the belief that the movable-wall oven test is superior to laboratory tests in common use.

* Bulk density 52 to 54 lb./cu.ft., combustion flue temperature, 1,375° C., width of test oven 12 in.

The practical question meriting discussion is the basis on which the results shall be interpreted so that coals or coal blends may be selected for carbonization with confidence. It is obvious that a coke oven wall will not be in danger from pressure effects if the pressure set up by the charge is always less than that which the wall can withstand. Unfortunately, the strength of a coke oven wall at the temperature of normal operation is not known, although Koppers and Jenkner have stated that the onset of rupturing is liable to take place under a lateral pressure of 1.2 lb./sq. in., their statement being based on experiments made on a single cold wall. The strength of a hot oven wall in practice is influenced by the buttress effect of neighbouring charges and walls, and therefore the schedule of operations of the ovens is also of importance. As a result of testing a large number of air-dried coals in a movable-wall oven similar to that used in the present investigation, Russell has advanced the following criteria:

(*a*) Coals and mixtures which produce pressures below 1.5 lb./sq. in. in the test oven are unlikely to develop excessive pressure in a normal coke oven.

(*b*) Coals and mixtures which produce pressures greater than 1.5 lb./sq. in. should not be used regularly in ovens greater than 10 ft. in height.

(*c*) Coals and mixtures which produce pressures greater than 2 lb./sq. in. in the test oven are dangerous.

Russell adds that " the bulk density of the charge in the test oven should be at least equal to the average bulk density of the coal in the full-scale oven and preferably 2 lb./cu.ft. higher."

The bulk density of air-dried coal is generally about 52 to 54 lb./cu.ft., and it therefore appears that the above criteria should be rigidly applied when the bulk density of the charge in the oven is 50 lb./cu.ft. or more. In Great Britain many coals are normally charged after having been crushed so that at least 80% passes $\frac{1}{8}$ in. mesh and with a moisture content of 7% or more; the average weight per cubic foot is less than 45 to 46 lb./cu.ft. on the dry basis. It may be held that the criteria suitable for a charge having an average bulk density of 50 lb./cu.ft. would have an added margin of safety when applied to a charge carbonized with an average bulk density of 45 lb./cu.ft. and less. On the other hand, it is well known that the bulk density in parts of the charge may reach a higher figure even though the average be only 45 lb./cu.ft. To avoid reduction in the life of a battery of ovens due to pressure effects on the walls, coals and mixtures of coals which are to be charged after crushing to sizes of the order of 80% passing $\frac{1}{8}$ in. mesh and with moisture contents of 7% and upwards should show a maximum pressure below 2 lb./sq. in. when tested under standard conditions in the movable-wall oven. It will be realized that the bulk density referred to above is that of the charge as it lies in the hot oven and is obtained by dividing the weight of the charge by the volume it occupies in the hot oven.

While it is practicable to carbonize coals which show a maximum pressure in the test oven greater than 2 lb./sq. in., such a course should be undertaken only if it is uneconomic or practically difficult to obtain a safe blend and with full recognition of the possible consequences of a reduction in the life of the battery. Some industrial blends show pressure in the movable-wall oven but are in regular use in this country. Particulars of the conditions under which they are carbonized are included in the table.

It has been suggested that damage may be caused by the regular use of coals which have insufficient shrinkage at the end of the coking period and that such damage is caused during discharge rather than by the pressures developed during the carbonization period. The tests in the movable-wall oven show that the pressure remaining on the wall when carbonization is complete and the difficulties in discharging the ovens were greatest for coals showing the highest pressures during carbonization. Furthermore, it has been observed that reduction of the maximum swelling pressure by blending or by reduction of bulk density of the charge was accompanied by increased contraction of the coke and increased facility of discharge. The tests have shown that little or no shrinkage is a sign of high pressure during carbonization and it seems likely from the experience with the ovens that coals which, through insufficient shrinkage, cause damage during discharge, will also develop pressures of sufficient magnitude to cause damage to the walls during coking.

The foregoing remarks refer to the implications of carbonizing coals which exhibit pressure characteristics under top-charging conditions. The effect upon pressure development of stamping or otherwise compressing the oven charge was not examined with the test oven. The work reported has demonstrated, however, the dependence of pressure development upon the bulk density of the charge. It is therefore a reasonable assumption, and one which is consistent with experience, that it would be possible, by compression, to cause an otherwise " safe " coal to exhibit pressures of serious magnitude.

The investigations described in this report were concerned primarily with a survey of the swelling pressures developed by British coals during carbonization. It is clear, from the results obtained, however, that further study of the factors influencing pressure development is required. In particular, information concerning the variation of the bulk density of coal throughout a coke oven charge would be valuable. The work dealing with the control of pressure development by blending might usefully be extended, and further investigation of the effects of using low rates of heating in the test oven could be undertaken with advantage.

HOBBIES EXHIBITION

The High Road lecture hall of the Tottenham and District Gas Company has been the scene of an exhibition in which employees of the Company have shown one another the results of their leisure-time work. Taking part in the Company's Hobbies Exhibition were 101 employees, 46 of them women, who displayed everything from a butterfly collection to oil paintings. Organized by a committee of nine under the chairmanship of Mr. H. W. Merrison and with Mr. F. G. N. Kendall as Hon. Secretary, the show included many striking exhibits such as a working model pipe organ with two stops, made from gas tubing; detailed scale models of aeroplanes, railway engines, a steam roller, and gas-works trucks; a collection of pottery; rugs and two stair-carpets; embroidery; paintings, sketches, and photographs; and a home-built short-wave transmitting station. Most unusual exhibits were of Mexican axolotl, shown by a pensioner, and home-grown tobacco shown by a member of the coke sales department.

"GAS JOURNAL" Photograph

A happy group on the occasion of the annual staff dinner and dance of Parkinson and Cowan (Gas Meters) Ltd., in London on Dec. 15

THE CATALYTIC REMOVAL OF ORGANIC SULPHUR COMPOUNDS FROM COAL GAS

A paper on the above subject (I.G.E. Communication No. 344) was presented at the research Meeting of the Institution of Gas Engineers on Nov. 25 by J. H. G. Plant and W. B. S. Newling, of the Gas Light and Coke Company. Here we give points from the introduction and the discussion.

PRESENTING the report, Mr. **Newling** explained that it was 10 years since Dr. R. H. Griffith described to the Institution the pilot plant results for the catalytic oxidation of the organic sulphur compounds in coal gas. A significant feature of the process was that the catalyst also affected the interaction of the oxygen present in the gas with some of the hydrogen. This internal combustion of hydrogen was potentially sufficient to provide all the process heat required by the full scale plant, which was accordingly designed to rely solely on the internal generation of heat; there was no costly external heating.

This full scale plant, Mr. Newling continued, has been in operation at Harrow since 1938. It went to work only 13 months after the catalytic oxidation of organic sulphur compounds was first observed in the laboratory. It was intended as an effective works plant, but of the simplest kind—the source rather than the result of full information. The present report records the main characteristics of the process which have been learned at Harrow and in the laboratory, and emphasizes particularly those features which govern the design of new plant and which should ensure ease and economy of operation.

Chemical Features

It is now clear why thiophen, the most refractory sulphur compound, cannot be effectively removed from coal gas by any practical catalytic process. In pure hydrogen, thiophen is easily destroyed but certain components of coal gas inevitably retard the reactions of thiophen; some, notably cyclopentadiene, destroy the activity of the catalyst towards thiophen by cumulative fouling. All attention is now focussed on the key reaction between oxygen and hydrogen. If this reaction is effected with sustained efficiency, the destruction of carbon disulphide, carbon oxysulphide, and nitric oxide will always be satisfactory. It is particularly important that the effects of catalyst fouling should be judged solely in terms of the activity of the catalyst for the combustion of hydrogen. Two kinds of fouling are distinguishable. At low temperatures, hydrocarbon polymers of medium molecular weight can, in relatively small quantity, obscure the active surface. At higher temperatures this gummy material distils forward or is carbonized to a less objectionable porous coke. It is therefore important to design the works plant so that the catalyst temperature lies in a narrow range, high enough to carbonize the fouling material found formed but not so high that it accumulates rapidly. In practice this range should be 300° to 400° C., or, better, 320° to 380° C.

The assessment of a catalyst should accordingly be related to sustained activity for the oxygen/hydrogen reaction in this temperature range, and should be carried through many cycles of fouling and regeneration. The simple catalyst of nickel subsulphide on fired china clay is, by this criterion, as good as any material yet available. Although there is still scope for the examination of promoted catalysts and other elaborate mixtures, concluded Mr. Newling, we have found more profit in a close study of the properties of the standard material and in considering how it may be used to the best advantage by improved plant design.

Mr. **Plant,** who also introduced the paper, said the experience they had gained at Harrow made them confident that they could, without serious corrosion difficulties, lower the thermal cost of the process by arranging for a much higher percentage of heat recovery; this required a proportionate increase in heat-exchange area. The heat exchanger itself had been modified in detail to simplify withdrawal of the tube bundle and to improve the heat transfer performance. The consequences of the increased heat recovery would be to reduce the heat outlet gas to within about 60° C. of the inlet gas main temperature, and at the same time to raise the inlet zone of the bed to within 80° C. of the maximum catalyst temperature. It would therefore be possible to keep the whole of the catalyst within the narrow range in which fouling was least objectionable.

The improvements in the design and operation which were proposed for any new installation would make it possible to work the process at a cost little higher than that previously announced for the Harrow plant under pre-war conditions.

DISCUSSION

Dr. **E. V. Evans,** O.B.E. (South Metropolitan Gas Company), opening the discussion, said he was reminded of many happy days, as long as 40 years ago, when he was actually working at the laboratory bench. Although many years of hard work were spent on the original Carpenter-Evans process, it was the fact that the methods adopted in those days were, in the light of modern procedure, nothing less than Edwardian. The heat exchange system was inefficient. The work was largely trial and error, and it was not until 10 or 15 years after the first plant had been working that Stanier and himself discovered that a subsulphide of nickel was the actual catalyst in the reaction. "You gentlemen to-day," continued Dr. Evans, "who practise chemistry and physics in the gas industry are really in clover! You are established and you are appreciated; but in those days we were considered odd people who came into the industry and were really not wanted. The gas engineer's picture of the chemist was that he should be in a little hut determining how much hydrogen sulphide there was at the outlet of the fourth box, and there he should stop. A most prominent gas engineer, after going over the South Metropolitan sulphur extraction plant, called me on one side and said, 'Young man, who do you think you are doing?' I told him. 'Well,' he said, 'this is what you are doing. You are cooling the gas down and you heat it up. You remove hydrogen sulphide completely and call it sulphuretted hydrogen, and you put it back again by this process. And what do you do? You take out a few grains of sulphur that have done no harm to anyone and you do not take it out completely. You leave in eight or 10 grains per 100 cu.ft.' I explained to him that there was a sulphur compound, a hydrocyclic sulphur compound, which was very resistant, and all he said was 'Resistant my eye!' That is the kind of reception that we had 40 years ago in the industry, but to-day matters are very different, and you are really much happier people."

A Fresh Attack

Dr. **R. H. Griffith** (Gas Light and Coke Company): "Even from the earliest days of the industry sulphur has been recognized as being highly undesirable in any form, and it was only when the lime purifier process had to be abandoned because of the highly objectionable character of its waste products that organic sulphur came into prominence again. Many years went by after that date, and it was only when Dr. Carpenter and his colleagues of the South Metropolitan Gas Company started a fresh attack on the problem that any progress was possible. As Dr. Evans has reminded you, they first pointed the way to the application of the catalytic process. The question may very well be asked, why has so long a time elapsed before there is any general acceptance of the principle of organic sulphur removal in the gas industry? I think the answer is that three conditions had to be met before this was possible: (1) We had to know just what the sulphur compounds were; (2) we had to understand their reactions to know just what happened to them when they were decomposed; and (3) we had to have the ability and the facility for the application of the most modern chemical engineering principles to the process which we wished to carry out."

These three conditions, concluded Dr. Griffith, could now be met and the gas industry could reduce its organic sulphur to a low figure when it decided to do so and whenever it thought it was worth the cost. When he said it could do so, he did not suggest that the process was one which required very careful control from specialists. No gas engineer would tolerate a scrubber yard in which a trained man had to sit hour after hour listening to the flow of liquor or with his finger on the controls of an exhauster. They have to treat organic sulphur removal in exactly the same way. It must be a plant which would run itself. The control should be so simple as to involve no more than sending the youngest member of the laboratory staff to read a chart on a recorder.

The Holmes-Maxted Catalyst

Mr. **Norman Hudson** (Mirfield) said that he had read the paper not only with a great deal of interest, but with a certain amount of surprise inasmuch as it not only gave a very interesting description of a plant which had operated for 10 years with purified unstripped coal gas from horizontal retorts at Harrow and the decisions that had been come to in the light of the experience gained, but also tended to compare the results and effectiveness of that plant with alternative methods of achieving the same objective which had been in practical use on other sites.

It was apparent that the authors were comparing the relative values for the removal of organic sulphur compounds of molybdenum disulphide and nickel subsulphide, and from this and related statements he could not but conclude that they assumed that the active component in the Holmes-Maxted catalyst was molybdenum disulphide. They did admit, however, that the Holmes-Maxted catalysts were described as metallic thiomolybdates, and it was this apparent inconsistency to which he wished to refer. There was no doubt in his mind that the authors had made a wrong assumption in accepting as fact that the essential chemical compound in the Holmes-Maxted catalyst used at Mirfield was molybdenum disulphide. It had been proved that the hydrogenating properties of this catalyst were very different from those of a catalyst consisting of molybdenum disulphide only or of copper sulphide only. A further indication

that the Holmes-Maxted catalyst was some compound other than molybdenum disulphide was given by the fact that the latter, as confirmed by the authors, did not continue to hydrogenate thiophen over an extended period, while a single catch of 40 cu.ft. of Holmes-Maxted catalyst which had treated over 400 mill. cu.ft. of gas was still hydrogenating 20% of the thiophen in that gas.

The authors had apparently decided that the most suitable industrial catalyst for the sulphur removal process still appeared to be nickel subsulphide on a china clay support, and the reasons advanced were that it was cheaper, more simple to manufacture, more resistant to fouling under selected operating conditions, and more active for the essential oxygen-hydrogen reaction than alternative catalysts. It also seemed apparent that the authors considered that the regeneration of the nickel subsulphide catalyst on a china clay support was to be preferred to the regeneration of alternative catalysts. The authors considered it necessary, however, to simplify the manufacture of their china clay catalyst carrier by producing it in the form of spheres by rotating in a rotary drum, followed by drying and firing in rotary equipment, and at the moment a full-scale test of the material was in progress on the Harrow plant. Was that because the material used to date had been difficult to make and had not sufficient physical strength in a porous granular form, and/or was it that the regeneration of the Harrow catalyst, as used up to date, had to be particularly carefully carried through, inasmuch as, if the temperature of regeneration was even a little too high, the nickel oxide could react with the clay, forming nickel silicate, and this tendency was worsened if the china clay support had originally been under-fired ?

Copper Thiomolybdate Catalyst

At Mirfield a copper thiomolybdate catalyst was used, which was very simple to prepare, the carrier being a bauxite base. The process of manufacture was standardized and was being performed by semi-skilled labour.

The authors discussed regeneration of catalyst material, and their conclusion gave the impression that they were not satisfied with their existing practice, since they stated that " it would be an advantage to have a process with a greater safety factor than that at present in use." Other observations in the paper indicated that control of temperature during regeneration was not positive and reliable, and the authors mentioned the fact that high temperatures—*i.e.*, greater than 600° C.—were harmful at this stage. This was certainly true, but the plant for the regeneration of the copper thiomolybdate catalyst was so simple and controlled that the process was perfectly safe and was performed by semi-skilled labour.

At Mirfield the spent catalyst was regenerated by passing through it the products of the controlled combustion of town gas, such combustion being arranged to provide a 5% oxygen content in the combustion product. The use of this low oxygen concentration performed the double duty of raising the fouled catalyst to regeneration temperature and at the same time the large volume of diluent gases was adequate to carry away the heat as it was generated. In addition, by using a deep catalyst bed in conjunction with strict counter-current flow of the combustion gases the chance of ignition of the catalyst was obviated, because when the oxygen concentration in the regenerating vessel was at its maximum the carbon burden was at a minimum.

They had approximately 40 cu.ft. of catalyst material in use, 15 cu.ft. being constantly in the plant. Daily, ⅜ cu.ft. of spent catalyst was withdrawn and placed in the top of the regenerator and ⅜ cu.ft. was taken from the botton of the regenerator and put into the automatic hopper feed at the top of the plant. The regenerator was constantly at work, and was thermostatically controlled, giving a catalyst body temperature of 480° C., and the routine daily attention to the catalyst occupied an unskilled person about 15 min. This catalyst had now been in use for four years, and the whole of it had been regenerated about 40 times. On practical results from the plant itself and on tests carried through in the laboratory on small convertors it was, apparently, as active as when it was first made and put to work.

Slight Loss By Weight

The only loss they had experienced had been about 3% per annum by weight, due to slight disintegration of the bauxite carrier, the fine material being sieved out every time a quantity of spent catalyst was extracted from the plant.

It would appear from the foregoing that there was adequate reason for the authors to reconsider their conclusion that " the features of the chemistry of molybdenum catalysts constitute a serious obstacle to their practical application with prolonged use on a full scale."

As the person responsible for the control and operation of the Mirfield undertaking, he would very definitely state that there was nothing in the chemistry of the copper molybdenum catalyst used in that undertaking for the past four years which constituted even a minor obstacle to its prolonged use for the hydrogenation of sulphur compounds in town gas on a full scale.

Mr. **T. B. V. Hirst** (London) remarked that it had been asked whether it was feasible or economic to provide miniature plants for removal of sulphur to be fitted to individual domestic gas water heaters in order to increase the maintenance life and total life of the apparatus by reducing corrosion. This did not seem likely to be practicable. There were, however, other uses for small-scale plant—for example, controlled atmosphere furnaces in which sulphur removal was vital to the work, and, in the case of electric furnaces, to the nickel-chromium heating elements also. Such plants varied a good deal in size, but a medium-sized one, costing some hundreds of pounds, might need 1,000 to 2,000 cu.ft/hour of coal gas. There were no doubt numerous other industrial uses for gas which must be sulphur-free.

Mr. **Charles Cooper** (W. C. Holmes & Co., Ltd.) asked the authors why they did not agree that the individual differences in performance of the catalysts tended to disappear as the working temperature was raised, and that when operated in the zone of 360-400° C. the differences in results were less notable. One read that the temperature range stated was desirable to avoid the appearance of cloaking or fouling in an undesirable form, and this circumstance was confirmed in long-term operation on other catalysts. It was, for example, the case that the hydrogen-oxygen reaction was extremely rapid even on a relatively inert catalyst at 380° C., if fouling was avoided. Any such reaction was accelerated with rise of temperature.

Question of Cost

As regards the disability attributed to the molybdenum compounds to application for prolonged use on the full scale, he would ask for the authors' views on how important was the cost of catalyst ? Catalyst had been in use for four years, with about 40 regeneration cycles, in one plant referred to in the text. The life of catalyst in industrial units varied in different plants, being as high as 240 days in certain cases, one volume of catalyst treating 2 mill. volumes of gas before fouling. The short period of use, per cycle, of 28 days on the Mirfield plant, had been gradually arrived at in consequence of the development of an extremely easy and almost automatic oxidation regeneration process. The details of this method, which employed a simple means of producing an atmosphere at the prescribed temperature with a negligible risk of over-heating, had been communicated in the " GAS JOURNAL " of Mar. 20, 1946, *et seq.* More recently the method had been made continuous and fully automatic, but the principle remained unaltered.

In all cases cited in the paper there had to be a second purification from H_2S, and dealing with this effect involved a good proportion of the capital cost of the plant. Something other than standard oxide box practice was sought, as there was little yield of sulphur to pay for the trouble. A good solution for this was offered by the highly reactive oxide mass employed on the Harrow Works. A liquid purification cycle had been used on the plant at Mirfield with success, but it would be realized that to deal with, say, 20 grains of H_2S might require plant extending to quite one-half of that which would perform complete purification of coal gas. Nevertheless, such a method offered the possibility of interposing the catalytic treatment at such a point in the series of liquid purification effects that a plant on the scale required for complete purification would carry out both stages of purification, if the catalyst was used which tolerated a moderate quantity of H_2S. Work on those lines was now proceeding on the full scale, its behaviour on a small scale having already been reported. Naturally, it would also be possible, in designing an oxide purification plant to interpose the catalytic unit, and to rotate the set while leaving the catalytic unit in the same relative position. The loss of oxygen after catalysis might, however, have to be made up in such a case. This need did not arise in the liquid purification series.

So far from being a process requiring, in practice, close attendance, the catalytic destruction of sulphur compounds now appeared to be, once the conditions had been set and controlled, one which was almost monotonously reliable and simple. Its acceptance by the consumers on the district was such that if, for any reason there was interruption, 24 hours was enough to collect complaints. A new terror might thus enter the life of the gas-maker as a reward for educating his consumers. Another tribute to its practicability was the successful use of many industrial units, particularly in the glass and metallurgical industries, in circumstances which were often quite unfavourable to any plant requiring much attention, and with long catalyst life in the majority of cases.

Reply to Discussion

Mr. **Plant,** replying to the discussion, said the remarks of Mr. Hirst had already been dealt with by Mr. Cooper. As regards the use of the process on consumers' premises, that was already being done on quite a large scale. In fact, the total amount of gas being treated on consumers' premises with nickel subsulphide catalyst was considerably greater than the 1½ mill. cu.ft. being treated at Harrow. A firm in the Midlands had taken up marketing these small plants and there were about 70 or 80 in operation, but he had no experience at all of using the process on such a small scale as a water heater. He thanked Mr. Cooper for giving his experience. It was always helpful to know what other people were doing. The matter of the position of the removal plant, particularly in relation to benzole recovery, was one of great importance, as also was the question of oxide purification. They were well aware of the fact that the actual removal of the sulphur was still the bulkiest part of the plant. Regarding Mr. Hudson's comments, he felt that perhaps the paper had created a wrong impression. They were not in any sense attacking other plants. They were only attempting to give a description of their own developments.

Concerning the regeneration process, this worked all right if they had a man used to it. They could regenerate catalysts easily by passing

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diluent gas over the top, obtained by burning a certain amount of coal gas, but they did not want to do that. They did not want to use any fuel. They wished to keep the process absolutely as cheap as they could.

Mr. Plant concluded by saying that the particular virtue of nickel subsulphide catalysts as compared with molybdenum catalysts was that they were effective for promoting the oxygen-hydrogen reaction; and he spoke very firmly when he affirmed that he was wedded to the process in which the generation of heat for organic sulphur removal must be generated internally, and that the nickel subsulphide catalyst was the best one for doing it in their experience, but not necessarily absolutely.

GAS IN FRANCE

(From Our Special Correspondent)

NEW price regulations in France indicate the beginnings of a return to conditions of free contractual relations. Regulations fixing the selling prices of gas sold by coke ovens and by one gas undertaking to another are repealed. On the other hand, gas for domestic cooking is increased by 25%. This increase will naturally be resented by the consumer, but it is less than that which would be necessary to establish the industry in that state of self-support which is defined as its ultimate goal under the law of nationalization. The new regulations introduce a novelty; a variation in price in proportion to calorific value when this is guaranteed to be superior to 4,200 calories. A tariff based on this principle had been adopted some time ago for compressed gas for use in automobiles, but the case was very special and its scope limited. Such a tariff will encourage the tendency towards the increase in calorific value of gas supply which has been sought for several years and which is said to be desirable from the three points of view of production, distribution, and utilization. There is no doubt, it is claimed, that from a sales point of view rapidity of heating constitutes the major characteristic of gas, and if this property is valuable in the kitchen it is still more so in the instantaneous water heater, for which gas has no competitor. "The combination of gas of good quality with the stamped, approved apparatus," says the Editor of the *Journal des Usines à Gaz*, "will place a trump card of the first order in the hands of the commercial service, to the double profit of Gaz de France and its clientèle."

New Works at Lisbon

The principal feature of the current *Journal* is the first instalment of a full description of the new Matinha Gas-Works at Lisbon. Gas was introduced by the Lisbon Company of Gas Lighting in 1848. The first works erected by this Company was situated in the centre of the city and that of 1887 on the banks of the Tagus near the Tower of Belem. The gasholders were later moved, in response to public opinion, to another site; but when in 1891 the two companies of gas and electricity were amalgamated public clamour took a more violent turn, and when the concession was renewed in 1928 a clause was introduced enforcing the removal of the works to a more inconspicuous situation. Finally it was decided in 1935 to erect new works at Matinha on ground reclaimed from the river north-east of the city. The work was retarded by war conditions. Nevertheless in January, 1944, one of the most modern and best equipped works in Europe, constructed by two contracting firms in France to specifications prepared by the Engineer of the Company and "Sofina" of Brussels, was inaugurated.

When negotiations commenced in 1938 the daily demand was of the order of 40,000 cu. m. (1,413,000 cu.ft.), but growth was so rapid that the first section of the works was designed for a daily output of 75,000 cu. m. (2,650,000 cu.ft.) in 1939 and 1940. The second section to be completed in the following years was to increase this to 100,000 cu. m. (3,531,000 cu.ft.) and finally the scheme was devized for an ultimate extension to twice this capacity.

The carbonizing system decided upon was that of the continuous vertical retort, and as the coal used is normally imported from England the Woodall-Duckham setting was adopted. The work was commenced in the spring of 1939 and everything was set for completion in record time. Unfortunately, under prevailing conditions, it was not until the end of 1943 that gas was made in the new works. And by this time the growth of demand was such that not only was it impossible to cease work at Belem, but the second section was proceeded with without delay, and the works now inaugurated has the full daily capacity of 100,000 cu. m.

The construction of the carbonizing plant was entrusted to the Cie Générale de Construction de Fours. The plant contains seven settings each with four Woodall-Duckham retorts 8.490 m. (27 ft. 10 in.) by 2.600 m. (103 in.) with carbonizing capacity of 9 tonnes of coal per day. The building is of the steel-framed "semi-umbrella" type partially supported from the buckstays of the retort bench. The foundations for the retort bench presented a delicate problem. Borings had revealed that the subsoil consisted of alluvial gravel resting on beds of fine sand and of calcareous grit, the last being of good bearing value. All the beds sloped towards the river. After loading tests it was decided to sink pillars of reinforced concrete on to the gritstone bed and finally to tie the heads together in a raft of reinforced concrete upon which the retort bench was built. The result is perfectly satisfactory; no settlement or deformation has been observed.

The retorts and settings are built in French refractories and designed for upward heating and with all the last developments and refinements of this system. Heating is by external mechanical producers delivering de-dusted gas at 350°C. to the settings, or alternatively by a mixture of coal gas and waste gases regulated to give a calorific value similar to that of the producer gas. The two heating gases are distributed to the settings by separate flues so that heating can be done by one or the other, or by both simultaneously. The normal producer fuel is small coke, 8 to 25 mm.

Steam supply to the producers is obtained from their own water jackets, from which any surplus is used for general works purposes. Waste heat is recovered in Spencer-Bonecourt horizontal tubular boilers with fan-induced draught. Steam temperature can be raised to 350°C. in superheaters. A chimney is provided for alternative natural draught.

Coal and coke handling plant is designed to reduce manual work to the minimum. Coal is taken from yard storage by inclined belt to a breaking and weighing station and thence elevated to the top of the retort bench, in the bunkers of which it is distributed by belt, all of 30 tonnes/hour capacity, arranged for duplication. Coke is taken from the bench in side-tipping wagons on a Decauville track, screened in the retort house to take out dust through 8 mm. and smalls 8-25 for producer feed. The wagons are lifted on a Temperley transporter to the screening plant and finally to yard store. This combination is designed for an hourly capacity of 15 tonnes. The fines are burned in Babcock & Wilcox boilers fitted with a chain grate designed for this purpose.

Another feature in this issue is a note on the deposit of ashes on the heating surface of boilers by M. F. Delarozière based on the paper presented to the recent Fuel Economy Conference at La Hage by Mr. Crossley giving the results of the work of the British Boiler Availability Committee. The author was prompted to write this note by the difficulties arising out of the use of increasing quantities of American coals in the Babcock boilers at Nanterre fitted with mechanical grates and forced draught fed by coke fines.

Compressed Gas for Motor Transport

M. P. Courtel contributes a note on the development of compressed gas for motor transport in France. The number of vehicles serviced has remained pretty constant at about 30,000 since 1943. Of the 210 compressor stations which have been constructed, representing a capital of the order of 2 milliards of francs, more than 150 are still working satisfactorily. This surprising state of affairs more than three years after the cessation of hostilities is explained by the development in the production of natural gas and by the shortage of imported petrol. It is the author's personal opinion that the use of compressed gas, particularly of the high calorific natural gas, will continue to make progress. It is noted that other countries with similar supplies have recently placed orders in France for new compressor equipment. The use of ordinary (town) gas is probably stationary, though there is a slight tendency to increase. If petrol is again freely imported, no doubt stations less well placed would tend to shut down; but there are a considerable number in centres where the density of population and of vehicles is sufficient—for example in the Paris region, that of the Nord or Lyons—where they will remain. On the other hand, if the difficulties of importation of petroleum products persists, the use of coal gas might make a further extension in this direction.

Names of the members of the "Superior" Council of Electricity and Gas are announced. They include representatives of Parliament, the various Ministries, municipalities and provinces, consumers, the national services of gas and electricity and of the several grades of personnel.

Mr. Léon Perrier, who is one of the representatives of the Ministry of Industry and Commerce, is nominated President of the Council and of the permanent executive committee, which itself includes three members of each of the classes above referred to.

HARDENING OF OXIDE IN PURIFIERS

At the Research Meeting of the Institution of Gas Engineers on Nov. 25 an interim report (GRB 43) of the Gas Research Board on the subject of the hardening of oxide in purifiers was presented. The report was prepared by Dr. F. J. Dent, Dr. L. A. Moignard, and Messrs. J. W. A. Buckley, W. D. Davis, and A. D. S. Tantram. We give here points from the introduction and the discussion.

PRESENTING the report, **Dr. F. J. Dent** said that it was well recognized that the emptying of oxide boxes was one of the most unpleasant manual operations remaining on a gas-works and, at several places, much effort was being directed to the introduction of an alternative to box purification. Such efforts needed every encouragement, but the fact must be faced that the replacement of plant was difficult and likely to remain so for some time. Even were the perfect alternative process available, existing purifiers would be regarded as having many years of life in front of them. That being so, there was room for a short term project to see how far the difficulties with boxes could be reduced by operating so as to avoid as far as possible the oxide hardening and throwing back pressure without sacrificing its performance.

The oxide process removed a constituent present in gas in relatively low concentration and, as the boxes were rotated, conditions in the oxide were materially affected and varied with the temperature and humidity of the large volumes of gas which accompanied the hydrogen sulphide. Tar was often deposited in the oxide and operation was also affected by traces of other gas constituents such as ammonia and cyanides. There were even side reactions and decompositions in the main iron oxide—iron sulphide cycle. Further, it was a batch process in which individual charges remained at work for a considerable period, allowing the full development of the side reactions and accompanying complexities. Then, on top of that, the density of the oxide filling was doubled by depositing sulphur. There was little wonder that the oxide did cake, and it was as well to appreciate at the outset that, in seeking to avoid caking, one was seeking a great deal.

The characteristics of the process were important from another angle since they were such as to limit the methods available for investigation. Due to the complexities and the time factor it was almost impossible to reproduce conditions in short, small-scale experiments, while in view of the large number of variables such as type of oxide, rotation cycle, and so on, a comprehensive programme of tests on the large scale would take an inordinately long time.

On the other hand, it was a fact that this same time factor made the modification of the routine of day-to-day working a matter requiring some determination to carry through and, partly because of this, partly because of a tendency for the operation of any box system to be extended to the limits imposed by statutory requirements, what amounted to a tradition of purification tended to be built up at any one undertaking.

Results of a Survey

As a result is seemed probable that the influence on hardening of many of the features of operating methods could be detected by making a survey of the behaviour and conditions at a number of works. Even if the results obtained did not lead to final conclusions, there was more than a possibility that they would enable the most important variables to be selected for further investigation. The report dealt mainly with information gained on such a survey supported by the analyses of samples collected. The survey had not been regarded as complete and more works would be visited, but they were already convinced that it was a sound method for tackling the problem, and all the more so because of the ready collaboration they had received on every hand.

They had quickly been able to confirm that there were wide variations in both performances and operating conditions as between one works and another and, perhaps of more importance, they did find works with only slight caking at which the pick-up of sulphur per exposure was as high as 50-90 tons per 100 tons of oxide. In contrast, at other works, the pick-up was restricted to as low as 20 tons in order to avoid severe caking; and it became clear that, if the average performance at all works could be raised to equal the best, there would, overall, be a material reduction in the difficulties of the oxide process.

The findings were perhaps best summarized in the statement that a good performance could be obtained from purifiers without serious hardening, but no single dominant factor had emerged as determining whether oxide caked or not. Success depended upon taking several precautions. In view of the complexities of the process, that was perhaps not surprising, but it seemed worth stressing that, in general, hardening would only be avoided by paying careful attention to a number of points and not by concentrating upon any one of them. Perhaps of first importance was the necessity of preventing the deposition of tar in the boxes. They had been surprised at the high tar contents found in some samples of spent oxide. It was particularly noteworthy that installation of precipitators before the boxes was not enough, and the gas had to be properly cooled before reaching the precipitators, or else there would be subsequent condensation of oily vapours. So far as the survey had gone the indications were that there was less trouble with hardening at coke ovens than at gas-works, and this they attributed mainly to there being less deposition of tar. It was significant that coke ovens often maintained a high activity in the oxide by re-heating the gas after the precipitators to a relatively high temperature as it entered the boxes, and this would tend to prevent the condensation of tar. Further, benzole was recovered before purification and there was some evidence that the oil wash was beneficial in removing polymerizable hydrocarbons.

The report also stressed that the filling of the oxide in the box should be of low density. In some ways that was equivalent to sounding a retreat, since clearly the greater the weight of oxide in a box the greater the amount of sulphur absorbed in reaching a saleable condition. But all the evidence they had obtained so far indicated that, with a charge of high density, back pressure and severe caking occurred before a saleable condition was reached. The works which averaged the highest pick-up of sulphur per 100 tons operated with charges of the lowest density.

Localized Deposition of Sulphur

The tendency for hard crusts to form near the inlet surface of a box was well known. In some cases it was due to tar, but the most general cause was the localized deposition of sulphur. Plainly it was desirable for the sulphur to be distributed as evenly as possible from the top to the bottom of the charge. With streams of six boxes and with boxes with which gas flow could be reversed it was easier to obtain a good distribution, but, with boxes not so equipped some assistance appeared to be obtainable by suitable choice of oxide and operating conditions. Although there were notable exceptions, many people held the view that hardness was increased if the oxide dried out during use and claimed that advantages were obtained by the use of live steam. Drying would result in the caking of colloidal matter and there would be a tendency for the crystallization of water soluble salts. There had been a surprising amount of soluble salts in many of the spent materials examined, partly due to their being present in the original oxide, but mainly as the result of side reactions. The indications here needed following up and that work was now in hand.

There were two features of the hardening of oxide upon which observations would be particularly welcome. First, there was the effect of leaving an oxide, usually a part spent oxide, in a box for a long period when it often hardened, even although it had had little sulphur deposited upon it. Secondly, there was the prevalent opinion that hardness was more severe nowadays than it was some years ago.

They had little definite evidence upon either of these two points. If tar was present in the gas or the oxide, hardening on standing could be regarded as the result of the solidification of the tar, but the effect had been observed at works where there was very little tar. Did it depend upon some re-crystallization of sulphur ? They did not know.

That hardening generally was more severe nowadays might be due to the presence of more light oil in gas as a result of the introduction of the vertical retort when the practice of washing the gas for naphthalene became unnecessary. Mr. Hopton had suggested that it might have been due to greater slips of ammonia. It might simply be the result of greater pick-ups of sulphur being obtained per exposure.

Anticipation of Further Co-operation

Dr. L. A. Moignard said that, in the report, no single solution of the caking problem had been put forward. The evidence suggested that there was no single cause and, therefore, no single cure. On the contrary there appeared to be several features of purifier box management and operation, careful attention to which was repaid by soft boxes, freedom from pressure troubles, and smoother working generally. As a result of the survey of works practice, and of the laboratory tests and investigations which supplemented it, four such features had been selected for special discussion. They were believed to be the most important ones, and during the coming year they were looking forward eagerly to collaboration with a number of undertakings in carrying out specific tests on them. In the report, attention was drawn first of all to the physical condition of the oxide—*i.e.*, its bulk density, size analysis, and porosity, and to methods by which oxide could be packed in a desirable condition. In principle, a high packing density should have the advantage of a high capacity for hydrogen sulphide absorption, resulting in less frequent changing of boxes, and it might well be possible to overdo the use of lightening agents. Nevertheless, the survey had shown that when the denser oxides ordinarily used were watered to a high sulphur loading, hardening and back pressure tended to result. Furthermore, the advantage of high capacity per box—*i.e.*, on a volume basis—might not even be realized. To oxides of dry bulk densities 29 and 37 lb./cu.ft. had been compared at one works, the denser taking up only 6.6 tons per 1,000 cu.ft. per exposure, as compared with the light oxide's 8.4.

It had been striking to find how variable the densities of oxides were. They had examined artificial oxides of dry bulk densities

ranging from 21 to 48 lb./cu.ft., a range as great as they had encountered with Dutch hog ore; some of those were very heavy (*e.g.*, 52 lb./cu.ft.), but others (*e.g.*, N.E. Dutch hog ore at 26 lb./cu.ft.) could approach a light artificial oxide.

There were important differences, too, between oxides in the proportions of the bulk volume which they occupied, which were available as free space for the deposition of sulphur and of the various other substances which accumulated in oxide. There was clearly no reason why the available space should be progressively occupied in the most economical possible way, and in their observation they had differentiated between small and large pores and free space between particles.

As the report indicated, it was possible to use a light oxide and still to suffer hard caking. The importance of tarry materials brought into the boxes by the gas was emphasized: only in one case had an oxide been found containing more than 1% of tar which had not been severely caked and, although the exact mechanism whereby the tar caused hardening was in doubt, the practical step was to eliminate it. For this purpose, effective condensation and efficient tar fog removal, in combination, were essential. That meant cooling the gas to a temperature below that at which the boxes operated and removing the tar fog at the lowest temperature in the stream, and re-warming the gas before it entered the purifiers. There was then no opportunity for further condensation in or before the boxes.

Evidence about the influence of moisture changes in the boxes was conflicting; some works found drying out to be associated with hardening while others did not.

DISCUSSION

Mr. **G. U. Hopton** (Gas Light and Coke Company) said that there were those who thought that oxide purification was like the man in the song with the haunting refrain: " He's dead but he won't lie down." They pointed to the acknowledged difficulties of the process and said that it was high time that it was replaced by a liquid method. This demand had been made through the history of the gas industry, and the strongest evidence of the difficulty of finding a satisfactory method was that, despite all the work that had been done, and all the processes that had been tried, they still used oxide. Broadly speaking, the difficulties in the way of liquid purification were corrosion, effluent disposal, undesirable by-products, and the very high standard of purity of gas imposed in this country. It was not the least use becoming impatient and rushing into the minefield of liquid purification before these dangers had been properly dealt with. At the same time it should be recognized that many of them were fully aware of the need for an improved process and were constantly searching for it. Supposing that a satisfactory liquid process would be found, it was almost certain that, whatever reactions were involved, the plant would require skilled supervision and would embrace several stages, including filters if the products were elementary sulphur, a Claus kiln or contact acid plant if the product was gaseous hydrogen sulphide. It was highly questionable whether such plant was suitable for small works, and whatever might be the future trend, there would be numerous small works for many years yet. Then again, granted that a liquid process would be suitable for large works, it would be many years especially with the present scarcity of materials, before large-scale replacement of existing boxes could be completed. And so, they must reckon with the continued use of oxide boxes for some considerable time.

As part of the research on the improvement of the oxide process, the Gas Research Board was starting an investigation into the extraction of spent oxide. The final answer to their problems might be liquid purification at large works and oxide purification at small works with extraction of the spent oxide. Moreover, the choice of a suitable liquid purification process might depend more on the avoidance of corrosion, effluent difficulties, and undesirable by-products, than on a high degree of removal of hydrogen sulphide from gas in which case the last traces of hydrogen sulphide might have to be removed by oxide, probably in a highly active granular form, when extraction of such oxide would be important.

The most striking feature of the report was the wide variation in practice from works to works. In some cases it was only too evident that conditions were bad, as for example where tar fog removal before the purifiers was incomplete, or where condensation and cooling were inadequate. Before any other steps were taken to follow the recommendations in the report, those matters must be put right. The same advice applied to high ammonia slip, which was well known to be undesirable on several grounds. Other features discussed in the report had not previously been adequately recognized as objectionable. For example, it appeared that caking was favoured by charges of high density, yet there was a temptation to pack as much oxide as possible into a box so as to reduce the frequency of changing. The choice might appear to lie between hard oxide and long life, but in truth it was by no means certain that a longer life was given by a denser charge, because back pressure might necessitate discharging the box long before it became inactive. The effect of moisture was more controversial, but it had begun to look as though excessive drying out was a bad feature. This was of interest because of the presence of crystallizable salts in oxide, whose formation must be minimized by avoidance of excessive temperature rise in the oxide.

A recommendation with which they would all agree was to improve the distribution of sulphur throughout the bed of oxide. One way of doing this was to allow hydrogen sulphide to slip quite heavily at the outlet of the first box, but then one must face the effect of the final purity of the gas. It might be that limitation of the number of boxes in series to four militated against the use of this practice, and particular attention should be paid to the results from works where five or six boxes were used. The other way of improving sulphur distribution was by periodic reversal of gas flow within the box, and there was evidence that provision for gas reversal was well rewarded.

Arguments from Mirfield

Mr. **Norman Hudson** (Mirfield) remarked that the interim report had been presented, he understood, not only to inform the members of the Institution of the " state of the enquiry " but also to give those members an opportunity to contribute anything which they considered might be useful to the investigations at this part-way stage of the enquiry. If that was so, he would like to take the opportunity of indicating that he thought that in the " explanations " listed in the report there should be added to the eight reasons for hardening and development of back pressure a further reason—namely, failure adequately to dissipate the heat generated in the oxide mass. He thought that it would be safe to surmise that any tendency for the oxide mass to develop caking or hardening tendencies was due to the fact that the oxide mass was not in a suitable physical or chemical condition to handle or treat the gas in the condition in which such gas was delivered to the purifiers for treatment. If such a premise was correct, then he suggested that first consideration be given to the conditioning of the oxide to treat gas made with standard or average manufacturing plant, rather than a change be considered in the treatment of gas prior to its being passed to the purifiers, providing, of course, that the plant was being used efficiently. It was also safe to presume that, whatever be the cause, the reason for the development of back pressure or caking was the filling of the voids in the oxide mass, and it was highly probable that the nature of the filling material might vary from works to works. In fact, the authors had pointed out that, due to a high range of sizes, many works had very little void capacity within the oxide bed, even when the oxide mass was originally put to work. In other cases the voids were gradually reduced in size during the working of the purifier.

At Mirfield they had found that the structure of mildly-caked lumps of oxide was destroyed by a CS_2 wash, and had decided that the bond in that case, in the main, was sulphur and possibly to a small degree that material which was conventionally booked as " tar." It was also found that the extent of hardening was definitely related to the moisture content of the oxide, and that once the moisture content fell below 10% hardening and consequent back pressure developed very rapidly. To recapitulate, hardening tendencies appeared to coincide with the appearance of sulphur in the voids of the oxide mass and a drop in moisture content to below 10%.

Overload

Mr. **H. B. Avery** (Hardman & Holden, Ltd.): We are faced to-day with a condition of overload. It seems to me, therefore, that the hardening and caking of oxide is largely due to the formation of a lattice structure which, at an early stage in the layer is exposed to the gas, the sulphur forming a cement at the points of contact of the oxide particles and giving a rigid structure to the oxide as a whole. This is progressive in a downward direction in the case of downward flow so that one is faced with a very hard cake on the top of the oxide. In many cases, this may contribute to a back pressure due to the downward thrust of the spent oxide forcing the untouched oxide into the spaces of the grid and giving a back pressure at that point and hardening at the top of the layer. In the case of a works where the oxygen is kept to a minimum and where it is admitted to the second box, obviously conditions are produced which tend to minimize the effect of the localized high temperature, and it is possible for this reason that no hardening takes place because little or no cementing action of the sulphur occurs in the particular works.

ACCOUNTING RESEARCH

The Incorporated Accountants' Research Committee has launched a new venture in *Accounting Research* (Cambridge University Press: 7s. 6d.), a 90-page bi-annual publication, the first volume of which has just appeared. Its purpose is to make public original contributions discussing the practice of a profession which " compared with ancient ones such as law and medicine " is " a very young one indeed."

In this first volume, the contributions include a paper on the presentation of central government accounts, notes on accounting research, a review of fifty years of the profession's life, a study of the nature of income and capital, and notes on replacement costs. Particularly interesting for its practical applications is a paper on the use of departmental accounts as a guide to the allocation of floor space. There are also book reviews and notes on the Research Committee's prize scheme.

TRADE NEWS

Crone & Taylor, Ltd., St. Helens, Lancs, have produced a new 40 ft. mammoth stacker, details of which are given in their leaflet P.C.31. It is claimed for the machine that it has extreme mobility enabling it to be used at many sites to which a normal machine could not be taken in time to be of service; a high capacity of 60 tons per hour; an unusually high effective stacking capacity of 20 ft. for coal or 23 ft. for sand; quick and easy height adjustment by hydraulic jacks; a large hopper capacity; and rugged construction throughout.

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F.A.-Neat, Ltd., announce that agreements have been made between Ascot Gas Water Heaters, Ltd., and themselves, providing as follows:

That as from Jan. 1, 1949, Ascot Gas Water Heaters, Ltd., are appointed the sole selling organization for all products of F.A.-Neat, Ltd., for all territories.

That, during the ensuing months, Ascot Gas Water Heaters, Ltd., will become responsible for the whole of the manufacture of all F.A.-Neat products. The existing development and servicing facilities of Ascot Gas Water Heaters, Ltd., will be available as required in connexion with F.A.-Neat products.

Apart from correspondence relating to money due to F.A.-Neat, Ltd., all correspondence, orders, and enquiries concerning F.A.-Neat products on and after Jan. 1 should be addressed to Ascot Gas Water Heaters, Ltd., 43, Park Street, London, W.1, and branch offices. F.A.-Neat, Ltd., will continue as a separate concern, under its existing managements, but its activities, apart from its interest in the arrangements notified above, will be mainly concerned with development work.

Smokeless Open Fire

Messrs. Orme, Evans & Co., Ltd., one of the companies controlled by J. Brockhouse & Co., Ltd., are now producing a new air-controlled gas-ignited smokeless open fire which incorporates the features of the Brockhouse fires which gained popularity prior to the war. Air-control in solid fuel fires is a big step forward and enables the user to control by a simple damper the inlet air for combustion. Open fires have, in the past, had the disadvantage of intermittent burning and gave the extreme output, gradually diminishing to a very poor output until re-loaded. Controlled combustion can only be achieved by high precision in manufacture obviating all air leakage to the fuel bed other than that controlled by the user. The A.C. Beacon is fitted with a simple gas ignition burner and heat resisting grate bottom, which in normal circumstances, stand up indefinitely to the intense heat obtained from coke. Finished in beige and brown shaded vitreous enamel the general lines of this model are in keeping with the modern trend. The fire is, at the moment, only available in the 16 in. size, to fit into a standard 16 in. opening. Although designed primarily for use with open fire coke it will burn any type of household fuel with maximum economy.

A glossary of terms in common use in the manufactured and mixed gas industries of America, by F. H. Achard and Earl R. Hamilton, has been published by Dracha Personnel and Training Services, 755, Boylston Street, Boston, price 60 cents. It is in the form of a 48-page booklet, containing over 700 definitions, which have been reviewed by laymen, a specialist in business English, a gas engineer, and a training specialist.

COMPANY NEWS

Powell Duffryn, Ltd.

The Directors of Powell Duffryn, Ltd., have announced an interim dividend of 3% on the £9,660,471 Ordinary stock in respect of the year ending Mar. 31, 1949. Payment will be made on Feb. 23 to holders registered on Dec. 31. The rate is the same as last year, when the final was 5%.

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Primitiva Gas Company of Buenos Aires

The three valuers who are assessing the expropriated Primitiva Gas Company of Buenos Aires expect to have their report ready by the end of February. On Nov. 30, the civil judge ordered the Company to pay the municipality of Buenos Aires 5,915 pesos claimed for a previous over-charge. The judge rejected a claim by the Company for 1,129,799 pesos for extra costs, within the terms of its concession, for use of oil when coal was unavailable. The lower and Appeal Courts rejected the municipality's claim for 26 mill. pesos for alleged excess profits, and the Supreme Court ordered the case to be returned to the lower court for a new verdict. Until the Company's valuation is finally complete, and until this court case is settled, the 14 mill. pesos which the Government paid into court as expropriation deposit on the main Primitiva undertaking, plus some 2½ mill. pesos covering sundry other matters, remain under embargo by the courts. In addition, pending the completion of the valuers' findings, the Government put up 1,600,000 pesos as expropriation deposit on the subsidiary, Province of Buenos Aires Gas Company (owned by Primitiva), which was nationalized in August.

A Field Marshal's Home

Islington Mill, Alton, Hampshire, a one-time water mill, has been converted into a comfortable residence for Lord Montgomery of Alamein. Among the architect's specifications for its improvement was a New World gas cooker. On the kitchen wall above the cooker is a clock mounted on a 21st Army Group shield commemorating Lord Montgomery's sensational series of victories in North West Europe. The architects were Messrs. Unsworth and Bostock, and the cooker was installed by the Farnham Gas and Electricity Company.

The kitchen of Islington Mill, Alton, residence of Field Marshal Lord Montgomery, in which a New World gas cooker is now installed.

Southwold Gas Light Company

The 101st Annual General Meeting of the Southwold Gas Light Company was held on Dec. 13. Mr. H. A. Adnams (Vice-Chairman) presided in the absence through illness of the Chairman, Mr. Andrew J. Critten, who was missing his first meeting since his election 28 years ago.

A satisfactory year of trading in all departments was reported. Despite the mild winter, sales of gas had equalled the totals recorded for 1947, when severe weather was experienced. The considerable fitting work included the completion of the installation of gas into the 48 new council houses. Mention was made of the fact that resetting of all the beds of retorts had now been completed, and that no expenditure in this direction need be anticipated for some years. Shareholders spoke of their regret that the undertaking was passing from private ownership to Government control.

The retirement of Mr. George Crick from the Managership of the Company on Sept. 30 last, after over 42 years of faithful service, was also referred to, and good wishes were extended to him. A vote of thanks to him and to the staff in general for their loyalty was carried.

A dividend of 10% on the Ordinary shares was declared.

GAS STOCKS AND SHARES

The start of dealings for the Jan. 11 account in the Stock Exchange last week aroused more interest than has been noticeable for some time. The result was a brighter position generally which was encouraged by improvements in British Funds. Some buying in this field was quite substantial while industrials also showed better form, with indications of broadening interest. Total dealings for the week were 32,901, compared with 31,528 in the previous week. Dealings in gas shares were 231, comparing with 229 last week, but many debentures eased on declaration of dividends. Details are given below. Primitiva Holdings eased 6d. to 22s. 6d. on Dec. 16 on reports of a delay in the valuers' report.

With the closing of the last account of the year on Dec. 14 levelling up operations and the clearing up of positions for the end-of-year balance sheets were more than usually noticeable. During the week, the Treasury made an Order under the Coal Nationalization Act, fixing interest rate payable under the provisions relating to interim income which covers the period from the vesting date until compensation is fully satisfied.

The week's changes in gas stocks were as follows:

OFFICIAL LIST

Assocd. Gas & Water Undrtkgs. Deferred.	22/3	—	23/3	— 3d.
Brighton, &c., 5 p.c. Perp. Deb. (xd. Dec. 15)	116	—	121	— 1
Bristol 4. p.c. New Deb. (xd Dec. 15)	94	—	99	— 1
Cheltenham 4 p.c. Perp. Deb. (xd Dec. 15)	94	—	99	— 1
Croydon 4 p.c. Perp. Deb. (xd Dec. 15)	94	—	99	— 1
Do. 5 p.c. Perp. Deb. (xd Dec. 15)	119	—	124	— 1
Derby 4 p.c. Red. Deb. (xd Dec. 15)	92	—	97	— 1
Newport 5 p.c. Perp. Deb. (xd Dec. 15)	110	—	115	— 1
Primitiva 6½ p.c. Red. Cum. Pref., (xd Dec. 15)	97	—	102	— 2
Reading 4 p.c. Perp. Deb. (xd Dec. 15)	91	—	96	— 1
South Metropolitan 3 p.c. Perp. Deb. (xd Dec. 15)	81	—	86	— 1
South Suburban 5 p.c. Perp. Deb. (xd Dec. 15)	118	—	123	— 1
Tottenham 4 p.c. Perp. Deb. (xd Dec. 15)	95	—	100	— 1
Wandsworth 5 p.c. Irred. Deb. (xd Dec. 15)	121	—	126	— 1
Do. 4 p.c. Irred. Deb. (xd Dec. 15)	94	—	99	— 1